Partnership Plan

September 5, 2002

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Section I. Executive Summary

United States Secretary of Energy Spencer Abraham and senior executives of DaimlerChrysler, Ford, and General Motors announced the FreedomCAR Partnership on January 9, 2002. FreedomCAR is a research initiative focused on collaborative, pre-competitive, high-risk research to develop the component technologies necessary to provide a full range of affordable cars and light trucks that will free the nation's personal transportation system from petroleum dependence and from harmful vehicle emissions, without sacrificing freedom of mobility and freedom of vehicle choice. The United States Department of Energy (DOE) and the United States Council for Automotive Research (USCAR)—representing DaimlerChrysler Corporation, Ford Motor Company, and General Motors Corporation—are the Partners in the initiative.

National Benefits

Today, the United States uses 26% of the world's oil but produces only 9% of the total global supply and has only 2% of the world's conventional petroleum reserves. Unless the United States is successful in energy efficiency efforts and utilizing more diverse resource feedstocks, its dependence on imported oil is expected to grow because of higher consumption and declines in domestic production.

The long-term vision for the FreedomCAR Partnership is the achievement of vehicles and fuels that lead to a clean and sustainable energy future. While no single strategy will free the United States from petroleum dependency in the near term, it is apparent that addressing energy use in the transportation sector is particularly critical. The transportation sector consumes two-thirds of all the petroleum used in our nation and is almost completely dependent upon petroleum as its energy source.

Therefore, the FreedomCAR Partnership gives the United States an historic opportunity to develop technologies that could lead to a personal transportation system that uses renewable energy resources and produces minimal criteria or net carbon emissions on a life cycle or well-to-wheel basis. Fuel cell vehicles running on renewable hydrogen offer a promising path toward achieving this vision. Success will establish the United States as a global leader in environmental and energy technologies and will be a key to ensuring future U.S. competitiveness.

Partnership Structure

The FreedomCAR Partners jointly conduct strategic planning, determine technical requirements, identify needed resources, establish research and development (R&D) priorities, and execute oversight of the R&D activities necessary to achieve the goals of the Partnership. The FreedomCAR Partnership functions through three main organizational units: the FreedomCAR Executive Steering Committee, the FreedomCAR Operations Group, and the FreedomCAR Technical Teams. Each organizational unit contains government and industry participants, an arrangement that strives for mutual agreement on all key FreedomCAR activities and decisions**.**

Technical Scope

A major thrust of the FreedomCAR Partnership is to support research and development of technologies to enable mass production of affordable hydrogen-powered fuel cell vehicles. The Partnership coordinates with public and private entities supporting technology development to enable implementation of a national hydrogen infrastructure necessary to support fuel cell vehicles. The FreedomCAR Partnership also supports R&D for other advanced automotive technologies through the continuation of key enabling research on internal combustion engines, combustion and emission control systems, lightweight materials, power electronics and motor development, and high-power/energy battery development. Each of these technology areas also has the potential to dramatically reduce oil consumption and environmental impacts.

Milestones and Timing

The FreedomCAR Partners have established aggressive technology-specific goals for 2010 to promote R&D innovation. Technical progress will be evaluated by the achievement of technical milestones for individual technologies and by hardware-in-the-loop simulated full-system validation.[†] Also, an external body of experts, such as the National Academy of Sciences/National Academy of Engineering, will conduct a biennial review of the FreedomCAR R&D portfolio and make recommendations concerning the overall balance and adequacy of the research effort, rate of progress, technical objectives, and schedules for each of the major technology areas.

How to Participate

Additional information about FreedomCAR and possible ways to participate can be found at the following locations:

For More Information
http://www.uscar.org
http://www.cartech.doe.gov

Contact Us
FreedomCAR@USCAR.org
FreedomCAR@ee.doe.gov
202-586-8055

[†] Hardware-in-the-Loop is considered to be "a full computer simulation (computer model) where one or more components of the model are replaced with actual hardware before a simulation is run."

Section II. Introduction

Partnership Description

FreedomCAR is a research and development (R&D) partnership between the United States Department of Energy (DOE) and the United States Council for Automotive Research (USCAR). USCAR was formed by the major domestic automakers to develop technology in selected pre-competitive research areas. USCAR member companies —DaimlerChrysler Corporation, Ford Motor Company, and General Motors Corporation— maintain their primary vehicle R&D and engineering (facilities and workforce) for the domestic market in the United States. FreedomCAR is a research partnership focused on collaborative, pre-competitive, high-risk research to develop the component technologies necessary to provide a full range of affordable cars and light trucks that will free the nation's personal transportation system from petroleum dependence and from harmful vehicle emissions, without sacrificing freedom of mobility and freedom of vehicle choice.

The vision for the FreedomCAR Partnership is the achievement of vehicles and fuels that lead to a clean and sustainable energy future. Fuel cell vehicles running on hydrogen made from clean, renewable sources of energy offer a promising pathway toward achieving this vision and could more than double the energy efficiency of today's vehicles while emitting only water. In the nearer term, renewable fuels and clean carbon-based fuels used in advanced internal combustion engines and fuel cells can make a dramatic contribution toward reducing petroleum consumption and vehicle emissions. Increased feedstock diversity, where hydrogen and other advanced fuels are produced from a combination of potential sources (renewables, nuclear energy, natural gas, coal and petroleum) will free the transportation sector from its nearly total dependence on petroleum. Producing these fuels using clean, efficient new technologies (including carbon capture) offers a clear path to achieve environmental goals and to support an improving quality of life.

The United States has an historic opportunity to embrace a truly environmentally sustainable future. The challenge will be to make that future economically sustainable through key technology advances. Success will establish the United States as a global leader in environmental and energy technologies and will be a key to ensuring future U.S. competitiveness. In fact, the promise of clean, available energy is the primary basis for the FreedomCAR Partnership that was announced on January 9, 2002.

The CAR in FreedomCAR stands for Cooperative Automotive Research. And the "Freedom" principle is framed by:

- Freedom from petroleum dependence;
- Freedom from pollutant emissions;
- Freedom for Americans to choose the kind of vehicle they want to drive, and to drive where they want, when they want; and
- Freedom to obtain fuel affordably and conveniently.

A major thrust of the Partnership is to develop and validate the technologies necessary to enable mass production of affordable hydrogen-fueled fuel cell vehicles. Additionally, FreedomCAR

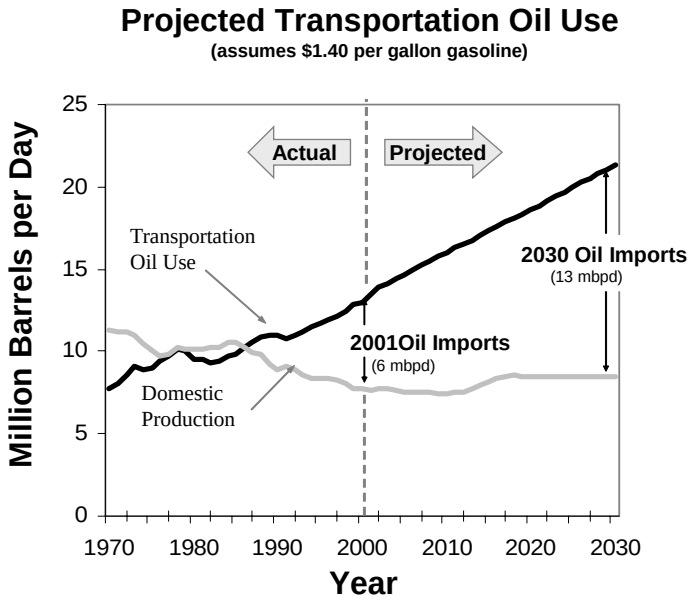
will address technology barriers that hinder the commercialization of hybrid electric vehicles which also offer the potential to significantly reduce the nation's dependence upon foreign oil. To achieve this goal, the FreedomCAR Partners have developed the following strategic approach:

- Develop technologies to enable mass production of affordable hydrogen-powered fuel cell vehicles.
- Coordinate with public and private entities supporting technology development to enable the national hydrogen infrastructure necessary for the viability of fuel cell vehicles.
- Support other technologies to significantly reduce oil consumption and environmental impacts in the nearer-term.
- Develop component technologies applicable across a wide range of passenger vehicles.

National Benefits

The government and industry research Partners recognize that the steady growth in the amount of imported oil needed to meet the U.S. demand for petroleum products presents energy security issues and is not sustainable for the nation indefinitely. In 2000, the United States consumed nearly 19 million barrels of crude oil per day, of which over 10 million barrels were net imports. America's transportation system is over 96% dependent on petroleum as an energy source and accounts for two-thirds of total U.S. petroleum consumption. Personal transportation (cars, light trucks, and SUVs) accounts for 60% of transportation oil use.

Figure 1 illustrates the expanding gap between projected domestic oil production and projected U.S. transportation oil demand while the price of U.S. gasoline remains low by world standards. The future oil gap is based on the Energy Information Administration's current projections of oil prices, vehicle miles driven, and the U.S. fleet vehicle fuel economy. Significant changes in these factors would have corresponding influences on the size of the gap, greater or smaller. For example, a large increase in the price of oil could be expected to reduce the gap because it would likely spur reactions such as reduced driving and greater domestic production from marginal wells.



Note: Data and projections through 2020 from EIA (2001);
Beyond 2020, EIA trends extrapolated through 2030.

Figure 1: Projected Transportation Oil Use

Reducing U.S. dependence on petroleum will require a multi-tiered approach, including policy initiatives and research programs, across every sector of our economy. The transportation sector has a significant role to play in addressing this challenge, and success resulting from FreedomCAR research will help accomplish the broader national goals and objectives that are being pursued. Success will establish the United States as a global leader in environmental and energy technologies and will be a key to ensuring future U.S. competitiveness.

Partnership Responsibilities

The FreedomCAR Partnership is a collaboration between DOE and USCAR. The Partners will jointly conduct strategic planning, determine technical requirements, identify needed resources, establish R&D priorities, and execute oversight of the R&D activities necessary to achieve the goals of the Partnership. In addition, the Partners will jointly develop a technical roadmap that outlines the technology-specific R&D goals (including cost targets) and milestones required to demonstrate progress. The Partners will coordinate with the energy providers and relevant government programs to evaluate the feasibility of associated hydrogen infrastructures. Furthermore, DOE will promote the development of a hydrogen infrastructure through R&D programs, government procurements, and cooperative demonstrations of hydrogen refueling station systems. The USCAR member companies will accelerate the migration of energy-efficient technologies to the marketplace and independently demonstrate progress toward real-world reduction of the petroleum consumption of passenger vehicles. The DOE FreedomCAR Partnership Office serves as the central point of contact for all Federal activity associated with the Partnership. USCAR similarly serves as industry's administrative arm. The organization and operation of FreedomCAR provide for shared leadership and technical guidance.

Technical Scope

DOE and USCAR have jointly developed the goals of FreedomCAR to reflect the technology breakthroughs needed to enable the commercialization of fuel-cell-powered vehicles. The significant barriers that must be overcome include fuel cell cold start, durability, electric drive performance, hydrogen storage efficiency, and cost. FreedomCAR will coordinate vehicle technology programs with parallel programs addressing the significant hydrogen production and infrastructure challenges.

Since there are many shared components between an advanced hybrid electric vehicle and a fuel cell vehicle, FreedomCAR will support research in areas that pertain to both types of vehicles, such as lightweight materials, power electronics, electric motors, and batteries. The Partnership also will pursue R&D in alternative fuels and advanced combustion engines (including emissions controls) that are needed to support the development of advanced vehicles.

Milestones and Timing

To measure progress toward the long-term vision, the FreedomCAR Partners have identified a number of technology-specific goals for the year 2010. As soon as a business case for the technologies can be established, USCAR member companies will commercialize technologies resulting from joint efforts. In the case of hydrogen-fueled fuel cell vehicles, commercialization will depend jointly on the viability of the technology as well as the widespread availability of affordable hydrogen fuel.

Section III. Partnership Structure, Responsibilities, and Management Process

Partnership Structure

The FreedomCAR Partnership consists of the three main organizational units shown in Figure 2: the FreedomCAR Executive Steering Committee, the FreedomCAR Operations Group, and the FreedomCAR Technical Teams. Each of these units has government and industry participants, an arrangement that ensures there is mutual agreement on all key FreedomCAR activities and decisions.

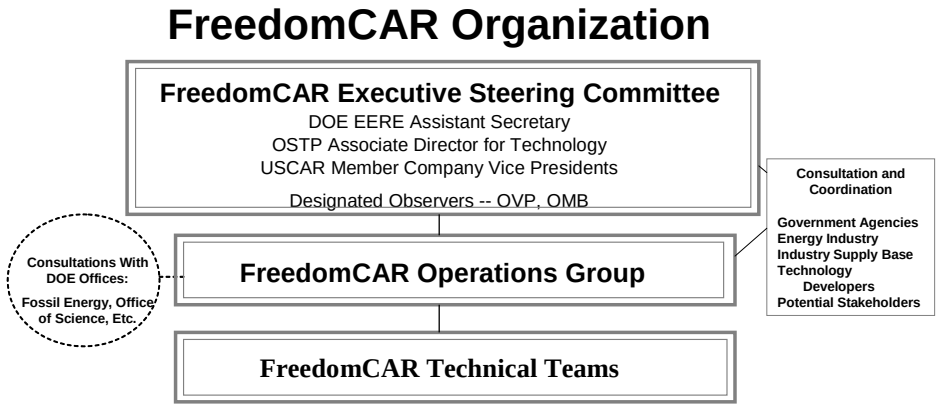


Figure 2: FreedomCAR Organization

The **FreedomCAR Executive Steering Committee** is responsible for the governance of the Partnership, including program direction and policy decisions. The Executive Steering Committee is comprised of the following primary members:

- DOE Assistant Secretary for Energy Efficiency and Renewable Energy (EERE),
- Office of Science and Technology Policy Associate Director of Technology,
- USCAR Member Company Vice Presidents.

The DOE Assistant Secretary for Energy Efficiency and Renewable Energy will chair the Executive Steering Committee.

Comprised of Directors from the Department of Energy and USCAR Member companies, the **FreedomCAR Operations Group** is responsible for programmatic direction of the Partnership. The primary responsibilities of the FreedomCAR Operations Group are as follows:

- Planning, development, prioritization and evaluation of the technical R&D program
- Assure availability of the needed technical expertise within government and industry;
- Preparation and scope of the biennial external technical program review
- Consultation and coordination with external agencies and parties.

The FreedomCAR Operations Group will make recommendations on R&D pathways and priorities. Each of the Partners will consider these recommendations in implementing its respective R&D programs.

Technical teams—consisting of scientists and engineers with technology-specific expertise from the USCAR member companies and national laboratories, as well as DOE program managers—are responsible for developing R&D plans and roadmaps, reviewing research results, and evaluating the technical progress of the Partnership toward meeting the established research goals. Each team will seek additional technical expertise from other sources, such as the supplier community or other government agencies, as agreed upon and where appropriate.

The technical teams will identify comprehensive technical goals related to improving the energy efficiency of vehicles, identify technical opportunities for productive R&D, identify technical expertise to undertake the technical effort, establish technical milestones, oversee progress in the R&D programs, and report progress at regular intervals to the FreedomCAR Operations Group and to external reviewers.

The FreedomCAR Partners expect to establish the following technical teams:

- Fuel Cell Systems
- Hydrogen Storage and Vehicle Interface
- Advanced Combustion and Emissions Control
- Systems Engineering and Analysis
- Electrochemical Storage
- Materials
- Electrical and Electronics

The technical team structure will continue to be assessed and additional teams may be added to this list as the demands and needs of the FreedomCAR Partnership evolve.

Partnership Management Process

The Partnership management process follows the standard approach of planning, execution, evaluation, and reporting. The process is implemented in a cyclical and iterative sequence that constantly uses new information to modify the plans and actions of the FreedomCAR Partnership.

Planning—Planning is conducted collaboratively within the Executive Steering Committee, the Operations Group, and the technical teams. The Executive Steering Committee is responsible for the governance of the program, including program direction, coordination among agencies, program timing, and oversight. The Operations Group develops the appropriate program plans and operational procedures that are required to implement the Executive Steering Committee's policy and strategic decisions. The technical teams are responsible for defining technical targets, identifying barriers, and developing the technical approaches and program milestones necessary to achieve the established research goals.

Execution—Accomplishment of the objectives of the Partnership requires collaborative, pre-competitive, high-risk R&D. Research funded by DOE is conducted primarily through competitively solicited contracts, cooperative agreements, cooperative research and development agreements (CRADAs), and research grants, or through funding of the DOE national laboratories' annual operating plans. Participation in CRADAs and cooperative agreements by industry usually depends on the degree of risk associated with a project. Industry support of R&D may be in the form of direct funding or in-kind contributions (e.g., staff participation, industry laboratory efforts, or contributions of equipment).

The Partnership intends to fund R&D activities at the national laboratories, traditional and non-traditional automotive suppliers, universities, small businesses, and other research institutions. It is expected that direct funding to automobile companies will be limited. In general, research projects will be selected competitively, with industry and government jointly developing the technical scope, priorities, and project measures.

Evaluation—Because the priorities and relevance of the research activities change, the FreedomCAR leadership will regularly measure technical progress and review the potential significance of all projects. DOE will conduct an annual merit review of all national laboratory research activities and will assemble a team of industry and university evaluators to provide an independent assessment of the national laboratory work. The FreedomCAR Operations Group expects to arrange for an external body of experts, such as the National Academy of Sciences/National Academy of Engineering, to conduct an independent biennial review of technical progress and program direction. In addition, the Hydrogen Technical Advisory Panel is commissioned to review the implementation and execution of the Hydrogen R&D programs authorized under the Hydrogen Future Act of 1996 and make recommendations to the Secretary of Energy. This review will include the potential economic, technological, and environmental consequences of the deployment of hydrogen production and use systems; an analysis of the effectiveness of the programs; and recommendations for improvement. Based on these evaluations, resource availability, and other factors, the FreedomCAR leadership will consider new opportunities, make adjustments to program targets, and set priorities as appropriate

Reporting—Detailed results of R&D efforts are documented in summary reports, annual progress reports, review meetings and workshops, and technical journals. Significant results also can be found at the DOE web site at http://www.cartech.doe.gov and the USCAR web site at http://www.uscar.org. (Some detailed results, such as those resulting from CRADAs, may not be immediately available to the public because of the need to protect the intellectual property rights of the cost-sharing participants.) The FreedomCAR leadership and participants in FreedomCAR R&D projects take part in public meetings, workshops, symposia, and conferences in order to disseminate information about the program, its progress, and the continuing technical needs of FreedomCAR.

Section IV. Objectives

Technical Scope and Objectives of FreedomCAR

Consistent with government initiatives to reduce American dependence on imported oil and to promote the development of hydrogen as a primary fuel for cars and trucks, the FreedomCAR Partners emphasize work on fuel cells and enabling technologies. However, recognizing that the necessary hydrogen infrastructure and affordable fuel cell vehicle technology may be more than a decade away, FreedomCAR also supports high-efficiency, petroleum-dependent technologies that have the potential to dramatically reduce petroleum consumption and environmental impacts. FreedomCAR focuses on developing component and sub-system technologies to achieve these goals.

The FreedomCAR Partners have established challenging high-level technical goals and timetables for government and industry R&D programs, to accelerate advancements in technologies that enable reduced oil consumption and increased energy efficiency in passenger vehicles.

The FreedomCAR Partnership will address:

- Fuel cell power systems
- Storage systems for hydrogen
- Coordination with public and private entities supporting technology development to enable the national hydrogen infrastructure necessary for the viability of fuel cell vehicles.
- The scientific basis for codes and standards to support the hydrogen infrastructure
- Electric propulsion systems applicable to both fuel cell and internal combustion/electric hybrid vehicles (e.g., power electronics, electric motors)
- Lightweight structural materials
- Electrical energy storage systems (e.g., batteries, power capacitors)
- Advanced combustion and emission control systems for internal combustion engines (employing a variety of fuels such as diesel, hydrogen, and renewable blends, and investigating innovative concepts such as homogeneous charge compression ignition systems, variable compression ratio, in-cylinder exhaust gas recirculation, etc.)

Technical challenges that affect significant affordability and manufacturability issues also will be addressed.

The selection of technologies for inclusion in the R&D program will be continually reevaluated as new opportunities arise. The FreedomCAR Partners have established aggressive technology-specific goals for 2010 in order to promote R&D innovation. Interim goals and milestones have been identified by the FreedomCAR Partners (see Section V). The interim milestones will be updated as deemed appropriate by each technical team to measure progress toward accomplishing the 2010 goals. Technical progress will be assessed by hardware demonstrations confirming the achievement of technical milestones and by hardware-in-the-loop full-system simulation. Technical progress and program direction will be assessed annually by the Partners and biennially by an external panel of experts.

Technology-Specific 2010 Goals[1]

This section summarizes the key technical goals for the 2010 time frame. Additional goals and milestones will be established by the technical teams as appropriate.

- To ensure reliable systems for future fuel cell powertrains with costs comparable to conventional internal combustion engine/automatic transmission systems, the goals are:
  - Electric Propulsion System with a 15-year life capable of delivering at least 55kW for 18 seconds, and 30kW continuous at a system cost of $12/kW peak.
  - 60% peak energy-efficient, durable fuel cell power system (including hydrogen storage) that achieves a 325 W/kg power density and 220 W/L operating on hydrogen. Cost targets are at $45/kW by 2010 ($30/kW by 2015) .[2]
- To enable clean, energy-efficient vehicles operating on clean, hydrocarbon-based fuels powered by either internal-combustion powertrains or fuel cells, the goals are:
  - Internal combustion engine powertrain systems costing $30/kW, having a peak brake engine efficiency of 45%, and that meet or exceed emissions standards.
  - Fuel cell systems, including a fuel reformer, having a peak brake engine efficiency of 45%, and that meet or exceed emissions standards with a cost target of $45/kW by 2010 and $30/kW in 2015.[2,3]
- To enable reliable hybrid electric vehicles that are durable and affordable, the goal is:
  - Electric drivetrain energy storage with 15-year life at 300 Whr with discharge power of 25 kW for 18 seconds and $20/kW.
- To enable the transition to a hydrogen economy, ensure widespread availability of hydrogen fuels, and retain the functional characteristics of current vehicles, the goals are:
  - Demonstrated hydrogen refueling with developed commercial codes and standards and diverse renewable and non-renewable energy sources. Targets: 70% energy efficiency well-to-pump; cost of energy from hydrogen equivalent to gasoline at market price, assumed to be $1.50 per gallon (2001 dollars).[4]
  - Hydrogen storage systems demonstrating an available capacity of 6 weight percent hydrogen, specific energy of 2000 W-h/kg, and an energy density of 1100 W-h/liter at a cost of $5/kW-h.[5]
  - Internal combustion engine powertrain systems operating on hydrogen with a cost target of $45/kW by 2010 and $30/kW in 2015, having a peak brake engine efficiency of 45%, and that meet or exceed emissions standards.
- To enable lightweight vehicle structures and systems, the goal is:
  - Material and manufacturing technologies for high volume production vehicles that enable/support the simultaneous attainment of:
    - 50% reduction in the weight of vehicle structure and subsystems
    - affordability, and
    - increased use of recyclable/renewable materials.

1. Cost references based on CY 2001 dollar values. Where power (kW) targets are specified, those targets are to ensure that technology challenges that would occur in a range of light-duty vehicle types would have to be addressed.
2. Does not include vehicle traction electronics.
3. Includes fuel cell stack subsystem, fuel processor subsystem and auxiliaries; does not include fuel tank.
4. Targets are for hydrogen dispensed to a vehicle assuming a reforming, compressing and dispensing system capable of dispensing 150 kilograms per day (assuming 60,000 SCF per day of NG is fed for reforming at the retail dispensing station) and servicing a fleet of 300 vehicles per day (assuming 0.5 kg used in each vehicle per day). Targets are also based on several thousand stations, and possibly demonstrated on several hundred stations. Technologies may also include chemical hydrides such as sodium boro-hydride.
5. Based on lower heating value of hydrogen; allows over 300-mile range.

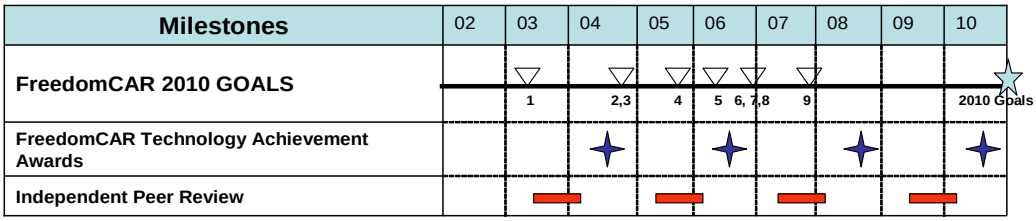
Section V. Milestones and Timing

The FreedomCAR Partnership is not designed to produce any particular vehicle, but rather to accelerate the adoption of advanced automotive technologies targeted toward a broad range of vehicles. Although the goal of mass-produced, hydrogen-fueled fuel cell vehicles is long-term, FreedomCAR also will support technologies such as advanced internal combustion hybrid vehicles, batteries, materials, and advanced electronics that will contribute to reduced petroleum consumption in the nearer term. The FreedomCAR Partners have established aggressive technology-specific goals for 2010 (shown on page 9) in order to promote R&D innovation. Interim goals and milestones will be established by each technical team as appropriate to measure progress toward accomplishing the 2010 goals. A partial list of interim milestones is shown in Figure 3. Technical progress will be assessed by the achievement of technical milestones for individual technologies and by hardware-in-the-loop simulated full-system validation.

The term "Validation" in the context of the interim milestones listed in Figure 3 is defined as "confirmation that the technical targets defined within each milestone for a given technology are met." The confirmation may be in the form of one or a combination of the following: analysis, simulation, bench test, hardware-in-the-loop, etc. Hardware-in-the-Loop is considered to be "a full computer simulation (computer model) where one or more components of the model are replaced with actual hardware before a simulation is run." Factors to be considered in choosing the appropriate validation method include availability of resources, scale-up issues, and the extent to which the chosen methodology represents real-world applications/conditions. The validation methodology for the interim milestones will be defined by the associated technical teams and will most likely vary.

The FreedomCAR Technical Achievement Award is sponsored by DOE and USCAR and is administered by the Society of Automotive Engineers International. It will be awarded to recognize exceptionally productive collaborations between government and industry researchers that make outstanding contributions to advancing the state of the art of automotive technology and the success of the FreedomCAR Partnership.

FreedomCar Partnership Interim Milestones



Interim Milestones

1. Pre-production prototypes of the Automotive Integrated Power Modules and Electric Motor Drive completed (1Q, 2003)
2. Fuel Cell Advanced Fuel Processing Go/No-Go Decision and Technology Downselect to meet 2010 targets. (3Q,2004)
3. Full-scale lithium-ion battery pack demonstrated via Hardware-in-the-Loop (4Q, 2004)
4. Validate fuel cell interim cost target of $125 per kW (4Q, 2005)
5. Intermediate, Integrated, Series Electric Drive Systems Technology Validated (2Q, 2006)
6. Downselect advanced hydrogen storage concepts showing potential to meet 2010 targets. (4Q, 2006)
7. Durable NOx and PM emission control technologies validated (4Q, 2006)
8. Hardware-in-the-Loop testing of advanced energy storage device completed (4Q, 2006)
9. Demonstrate integrated hydrogen refueling stations using advanced components to meet interim hydrogen fuel cost target. (4Q, 2007)

FreedomCAR 2010 Goals Demonstrated and Validated

FreedomCAR Technology Achievement Awards

Independent Peer Reviews

Figure 3: FreedomCAR Partnership Interim Milestones

Section VI. How to Participate

The USCAR member companies and DOE have historically maintained a close affiliation with other developers and suppliers of technology, including the supplier community, universities, small businesses, and individuals. The Partnership seeks out technologies from any sources that can make relevant and potentially important contributions toward the attainment of its goals.

Individuals and organizations have the opportunity to participate in FreedomCAR activities through several venues. Periodically, DOE will solicit and fund proposals for advanced automotive technology R&D in areas related to FreedomCAR goals. In response, qualified individuals and organizations can submit proposals to receive government funds to pursue promising R&D work on FreedomCAR-related technologies. For additional information concerning business opportunities and periodic competitive solicitations through DOE, please visit the following website: http://e-center.doe.gov. In addition to periodic solicitations, DOE funding to support FreedomCAR activities is routinely available through existing DOE programs such as these:

- **Cooperative Automotive Research for Advanced Technologies (CARAT),** managed by DOE, is structured to accelerate the development and production of innovative technologies that address barriers to producing ultra-efficient vehicles (http://www.ott.doe.gov).
- **Graduate Automotive Technology Education (GATE),** managed by DOE and Argonne National Laboratory, is a multidisciplinary automotive engineering program for graduate students (http://www.ott.doe.gov).
- DOE's **Small Business Innovation Research (SBIR)** program is designed to strengthen the role of small businesses in meeting Federal R&D needs, stimulate and foster scientific and technological innovation in the private sector, and increase the commercial application of innovations derived from federally funded research (http://sbir.er.doe.gov/sbir/).
- **Small Business Technology Transfer (STTR**) is closely modeled on the SBIR, with an additional requirement of co-participation by a research institution such as a university, non-profit institute, or contractor-operated, federally funded R&D center (http://sbir.er.doe.gov/sbir/).

The Director of the DOE FreedomCAR Partnership Office serves as the single focal point for managing Partnership-related activities on behalf of the Federal government.

For More Information
http://www.uscar.org
http://www.cartech.doe.gov

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